Rodrigo Schmitt

Space Systems Engineer, ML Engineer & Physicist
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Profile

Versatile aerospace engineer with a robust academic foundation in the physical sciences, complemented by practical experience in engineering software and hardware. Led innovative projects with multidisciplinary teams, receiving awards in prestigious competitions as well as competitive fellowships. Seeking to apply expertise in systems engineering, AI/ML, and Computer-Aided Design to contribute to cutting-edge technology development and to the realm of space exploration.

Education

PhD in Aeronautical & Astronautical Engineering | *Purdue University, IN, USA* GPA 3.9, *06/2021 - present*
- Received Ross PhD Fellowship (2021) and Bilsland PhD Dissertation Fellowship (2024).
- Coursework: Reinforcement Learning | Statistical Machine Learning | Generative Models | Multidisciplinary Design Optimization | System-of-Systems | Advanced Rocket Propulsion | Spaceflight Operations | Applied Control in Astronautics

MSc in Space Engineering & Technology | *National Institute for Space Research, Brazil* GPA: 4.0, *02/2021 - 02/2022*
- Received FAPESP MSc Research Fellowship (2018-2020).
- Coursework: Orbital Movement of Satellites | Periodic Orbits in the 3-Body Problem | Satellite Technology | Space Systems Engineering | Multidisciplinary Project Optimization | Thermal Control of Satellites | Control Theory

BSc in Astronomy & BSc in Physics | *University of São Paulo, Brazil* #1 in class, *02/2015 - 12/2019*
- Received CNPq Undergraduate Research Fellowship (2018) and AUCANI International Mobility Scholarship (2017).
- Coursework: Experimental Physics I-V | Statistics | Numerical Methods | Analytical Mechanics I-II | Electromagnetism | Fluid, Solid, Quantum & Statistical Mechanics | Stellar, Planetary & Galactic Astrophysics | Cosmology | General Relativity

Research Experience

AI-Driven Space Mission Design: Leveraging Reinforcement Learning and Explainable AI Towards the Generative Design of Space Systems
Dr. Daniel Delaurentis - System-of-Systems Lab, Purdue University, IN, USA *02/2022 - 06/2025*
- Used the **physics-based sandbox game** *Kerbal Space Program* and Realism Overhaul mod as a testbed for space system designs from the Artemis missions, such as the Human Landing System, Space Launch System, Orion and Lunar View refueling station.
- Explored the design of innovative space systems through **generative design** using Reinforcement Learning and simulated myriad **System-of-Systems mission architectures** involving the CR3BP to explain how variables affect outcomes using Explainable AI.
- Received **People's Choice Winner** (2023) and **Best Abstract** (2024) at Purdue's AAE Research Symposium.

LIDAR-Enhanced Drone Simulations for Mars EDL Operations | *Prof. Nathan Rose - Purdue University 10/2024 - 01/2025*
- Engineered **Drone-LIDAR integration**, including DJI Mavic 2 Pro Drone, Raspberry Pi, TIM561 LIDAR, GPS and IMU.
- Collected topographical data at the Mars Desert Research Station as part of Crew 306.

Maximizing Student Potential in STEM using Data Analytics
Dr. Daniel Delaurentis - System-of-Systems Lab, Purdue University *03/2023 - 05/2023*
- Analyzed Purdue data of **100,000 of students** towards understanding STEM student retention using Python.
- Obtained rates like **dropout, retention and STEM/non-STEM conversion** under interventions like internships and scholarships.

Swing-By & Radiation Analysis for Low Thrust Transfers to the Moon
Dr. Antonio Prado - National Institute for Space Research *07/2018 - 02/2022*
- Developed a 3D physical model of the Van Allen Belts in MATLAB; analyzed radiation absorption in **low thrust transfers**.
- Coded **Artificial Neural Network surrogates** and **lunar swing-by** models for optimal transfer analysis.

Mineralogical Analysis of an Apollo 16 Lunar Basalt
Dr. Clive Neal - University of Notre Dame du lac *01/2018 - 06/2018*
- Used electron microprobe on a **lunar sample** to obtain element compositions.
- Conducted **statistical analysis** using ANOVA regression to demonstrate that element weight percentage correlations up to $\rho = 0.88$.

CubeSat Development for Scientific Outreach | *Dr. Jane Hetem - University of São Paulo* *02/2017 - 06/2017*
- Integrated **Arduino with Printed Circuit Board electronics (PCB)**; tested sensors and camera using high-altitude balloon.

Professional Experience

Chief Communications Officer | *Translunar Exports & Servicing, IN, USA* *01/2024 - present*
- Drafted successful business proposals (AF STTR) for a satellite computer vision subsystem that enables precise relative navigation.
- Managed strategic partnerships, CRM, pitch deck, website, social media, company logo and outreach videos.

Graduate Teaching Assistant | *Purdue University, IN, USA* *08/2023 - 05/2024*

- Taught 50-minute classes, hosted 2-hour office hours, prepared assignments, coded solutions and graded exams.
- Courses: Multidisciplinary Design Optimization (Grad-level), Aerospace Propulsion (Junior-level).

Co-Founder, Front-end Project Manager, Outreach Member | *RocketPy, Brazil* *06/2021 - 02/2024*

- Co-founded and developed an advanced **Python rocketry simulation library** with **1,000s of users**.
- Led the development of RocketPy's first **User Interface in Flutter** to run simulations.
- Managed strategic partnerships, created outreach videos, co-authored a **journal publication**.

Co-Founder & President | *Space & Earth Analogs Research Chapter, Purdue University, IN, USA* *02/2022 - 12/2023*

- Co-founded and led the first dedicated chapter to human space exploration in the university with **60+ members**.
- Re-kindled Purdue's participation in the **Mars Desert Research Station** analog astronaut program by **fundraising $24k**.
- Received the "Pay It Forward Award" in **NASA's Spacesuit User Interface Technologies for Students (SUITS) Challenge**.

Grad Tech Diplomacy Fellow | *Krach Institute for Tech Diplomacy at Purdue, Washington DC, USA* *05/2023 - 07/2023*

- Moderated a **space diplomacy panel** with leaders from NASA, industry and academia to **100 attendees**.
- Created a **Customer Relationship Management system**; organized events with government and industry tech leaders.

Data Scientist, Machine Learning Specialist & Teacher | *Let's Code Academy, Brazil* *02/2020 - 02/2021*

- Taught **Python, Data Science & AI/ML**, covering libraries like **Numpy, Pandas, Matplotlib, Seaborn, Sklearn and TensorFlow**.
- Coded a **Reinforcement Learning AI** that recommended problems to optimize a student's learning curve.

Aerodynamics & Structures Member, Marketing Director, Structures Coordinator
Project Jupiter - Rocket Design Team, University of São Paulo, Brazil *07/2016 - 06/2017, 08/2018 - 07/2019*

- Manufactured carbon-fiber structure and glass fiber nosecone using vacuum infusion; designed rocket **CADs in Fusion 360**.
- Performed fluid and structural analysis using the Finite Element Method (FEM) in **ANSYS Mechanical** and **ANSYS Fluent**.
- Coded high-fidelity aerodynamics and analyzed dispersion on trajectories to 10,000 ft in Python using **Monte Carlo** simulations.
- Awarded 2^{nd}/26 in the 2019 **Latin America Space Challenge** and 1^{st}/25 in the 2017 **Brazilian Rocketry Competition**.

International Recruitment Advisor, Marketing Manager for Volunteer Exchange Programs
AIESEC, University of São Paulo, Brazil *10/2015 - 06/2016, 07/2016 - 12/2016*

- Received around 20 international students to work for 4 multinational and 2 national companies.
- Created **marketing campaigns** to attract students for volunteer exchange programs to third world countries.
- Performed weekly data analysis of customer market in Excel. Aligned **sales** and **customer experience** by developing buyer personas.

Publications

Journal Papers

- **ONEMARS: Requirements for Artificial Gravity in a Spacecraft for Transportation of a Crew to Mars**, IEEE Journal of Radio Frequency Identification, 2022. doi: 10.1109/JRFID.2022.3162098.
- **Swing-By Applications and Estimation of the Van Allen Belts' Radiation Exposure for a Spacecraft in a Low Thrust Transfer to the Moon**, Journal of Symmetry - Special Issue, 2022. https://doi.org/10.3390/sym14030617
- **RocketPy: A Six Degree-of-Freedom Launch Vehicle Trajectory Simulator**, Journal of Aerospace Engineering, 2021. DOI: 10.1061/(ASCE)AS.1943-5525.0001331

Conference Papers

- **X-SMART: Explainable Space Mission Architectures for Research on Trade-offs** , 2024 International Astronautial Congress.
- **Conceptual Design for a Space Debris Orbital Recycling Station Utilizing MBSE Approach**, 2023 IEEE Aerospace Conference. doi: 10.1109/AERO55745.2023.10115915.
- **Leveraging System-of-Systems Modeling to Explore Massive Reusability for Cislunar Missions**, 2023 IEEE Aerospace Conference. doi: 10.1109/AERO55745.2023.10115990.
- **Optimization of Low Thrust Transfer Orbits of a Spacecraft Considering the Radiation Hazard from the Van Allen Belts**, 2019 AAS/AIAA Astrodynamics Specialist Conference, Volume 171 of the Advances in the Astronautical Sciences Series.

Skills

- **Software**: Python | MATLAB | LaTeX | Fusion 360 | ANSYS | C | Fortran | HTML, JS, CSS | LINUX | Simulink | SQL | Flutter
- **Languages**: Portuguese & English (Proficient) | Spanish (Working Proficiency) | Japanese (Intermediate) | Italian (Basic)
- **Certifications**: Deep Learning Specialization (DeepLearning.AI); Spacecraft Dynamics & Control Specialization (CU Boulder); Remote Pilot Certification Part 107 (AFA).
- **Soft Skills**: Leadership, Public Speaking, Writing, Creativity, Teamwork.

Personal Interests

- Analog Astronaut Missions: Crew Journalist for the Mars Desert Research Station Crew 306.
- Outdoors: Backpacking (Mount Rainier, Grand Canyon); Climbing (Red River Gorge, New River Gorge).